

AN/FPN-63(V)PRECISION APPROACH RADAR (PAR) Life Cycle Extension

STATEMENT OF WORK

Dated 13 Sep 2012

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AN/FPN-63(V) Precision Approach Radar (PAR) Replacement Statement of Work (SOW)

1. SCOPE

This SOW establishes and defines requirements relating to the AN/FPN-63(V) PAR Life Cycle Extension (LCE). The entity performing the work as described in this SOW shall hereafter be referred to as the contractor.

2. BACKGROUND

Space and Naval Warfare Systems Command (SPAWAR) Systems Center Pacific (SSC Pacific) is the In-Service Engineering Agent (ISEA) for the AN/FPN-63(V) PAR system. The Air Traffic Control (ATC) Systems Division, Approach Systems Branch of the Naval Air Warfare Center Aircraft Division (NAWC-AD) Patuxent River (Code 4.5.8), has been tasked by NAVAIR PMA 213 (Naval Air Traffic Management Systems, Program Office) to support the AN/FPN-63(V) Life Cycle Extension Program.

2.1. HISTORY

To meet the Naval Aviation mission, the Navy procured a field change upgrade, solid state AN/FPN-63(V), in 1978. The AN/FPN-63(V) PAR is installed and used at Navy and Marine Corps air installations to provide safe, orderly, and expeditious recovery of aircraft in Instrument Meteorological Condition (IMC). There are 35 field units in use today within and out of the Continental United States (CONUS).

The AN/FPN-63(V) provides talk-down capabilities to land military and civil aircraft during reduced meteorological conditions. It also provides in-garrison training for controllers and pilots in support of aircraft carrier talk-down final approach landings.

The AN/FPN-63(V) is also used in conjunction with an airport surveillance radar system to provide a complete Ground Control Approach (GCA) capability for Navy, Marine Corps, and other military and civilian aircraft as required. Azimuth (AZ), Elevation (EL), and Range (RNG) to touchdown information are provided and displayed on the operator's console. This positional information of glideslope and center line deviation is then used by the air traffic controller to direct the aircraft commander, by radio communication, to a precision instrument landing. In addition, the radar set turntable allows for rapid realignment to touchdown points on multiple runways when prevailing weather conditions change.

The current fielded AN/FPN-63(V) has approached the end of its economic and technological life. Several components in this radar system have been in service more than 15 years past their estimated product life cycle. Obsolescence issues have been targeted for remedy through a series of engineering changes. The original equipment manufacturer (OEM) predicts technical system engineering support will be hard to find within 3-6 years, and after that the system will become completely unsupportable. Since other vendors have no

interest in continuing to support this obsolete technology, the system must undergo a life cycle extension to meet the Navy's needs and to serve as an interim bridge until Joint Precision Approach Landing Systems (JPALS) full operation capability (FOC) is reached in 2024. Otherwise, the supportability of this system will continue to deteriorate and ultimately mission effectiveness will be lost.

2.2. EXISTING SYSTEM CONFIGURATION

The AN/FPN-63(V) radar set consists of the PAR shelter, operations equipment, interface cabling, and radar turntable.

- The PAR shelter houses the antennas, transmitters, receivers, digital moving target indicator (DMTI) processor, PAR indicator, radar remoting equipment and ancillary equipment groups. Independent transmitters and receivers provide one operational channel and one "hot standby" channel. This allows the operator to use one set of equipment, while a technician performs maintenance on the other set.
- Operations equipment, operating remotely in conjunction with the PAR shelter, consists of remoting equipment, maintenance and supervisor's control panels, and up to six AZ-EL range indicators for use by the air traffic controllers. The solid-state AZ-EL range indicator generates its own internal map, sweeps, range marks, and cursors. A single cursor adjustment allows alignment of each cursor with the runway centerline.
- Interface cabling consists of AN/FAC-6(V)1 Fiber Optics Intersite System (FOIS).
- Radar turntable, operating locally and remotely for runway setup, is capable to cover 6 – 12 runway ends with rotation speed of 0.5 rpm in less than 5 minutes.

3. APPLICABLE DOCUMENTS AND ORDER OF PRECEDENCE

The following is a list of known documents that will be needed, used and referred to during the performance of the technical and engineering services required by this SOW. Unless otherwise specified, the revision level and date of each document specification or standard cited, or referred to within this SOW shall be the most current of superseding versions.

3.1. PRECEDENCE OF DOCUMENTS

In the event a conflict arises between the text of this contract and the references or drawings sited herein, the text of this contract shall take precedence. Nothing in this contract, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

Specifications:

MIL-DTL-5541F	Chemical Conversion Coatings on Aluminum and Aluminum Alloys
MIL-STD-13231	Marking of Electronic Items
MIL-S-901 D	Shock Tests, High Impact (H.I) Shipboard Machinery, Equipment, and Systems, Requirements For

MIL-PRF-31032B	Printing Wiring Boards, General Specification for
MIL-STD-129P	Military Marking for Shipment and Storage
MIL-STD-130N	Identification of Marking of U.S. Military Property
MIL-STD-461F	Requirements for the Control of Electromagnetic Interference Characteristics of Equipment
MIL-STD-810 G	Test Method Standard for Environmental Engineering Considerations and Laboratory Tests
MIL-STD-961E(1)	Defense and Program-Unique Specifications Format and Content

Handbooks:

MIL-HDBK-217 F (2)	Reliability Prediction of Electronic Equipment
MIL-HDBK-454B	General Guidelines for Electronic Equipment
MIL-HDBK-2036	Electronic Equipment Specifications; preparation of
MIL-HDBK-61A	Configuration Management Guidance
MIL-HDBK-3001(NOT1)	Guide to the General Style and Format of U.S. Navy Work Package Technical Manuals

Reference Documents:

DFARS 252.211-7007	Reporting of Government Furnished Property Equipment in the DoD Item Unique Identification (IUID) Registry
ANSI/J-STD-001	Requirements for Soldered Electrical and Electronic Assemblies
IPC-A-610	Acceptability of Electronic Assemblies
UFC 4-133-01N	Unified Facilities Criteria (UFC), Design: Navy Air Traffic Control Facilities
ISO 9001:2000	AS9100 Quality Management
ICAO Annex 10	Volume I: Aeronautical Telecommunications
NAVAIR 16-1-520	US Standard Flight Inspection Manual
	National Telecommunications and Information Administration (NTIA) Manual of Regulation and Procedures for Federal Radio Frequency Management.
NAVAIRINST 13800.17	Procedures and Responsibilities for Certification and Verification of the Precision Approach and Landing System
NAVAIRINST 4355.19D	Systems Engineering Technical Review Process
NAVAIRINST 00-25-300	Technical Manual Specification

UDI-M-22402	Publications Package, Field Change
DoDD 8500.1	Information Assurance
DoDI 8500.2	Information Assurance Implementation
DoDI 8510.bb	DoD Information Assurance Certification and Accreditation Process (DIACAP)
DoDI 8510.1	DoD Information Technology Security Certification and Accreditation Process (DITSCAP)
NAWCAD 43140-00991	General Acceptance Test Plan

Technical Manuals:

EE216-LA-OMI-010 -	Volume 1, Chapters 1-8; Operation and Maintenance Instructions
EE216-LA-OMI-020 -	Volume 2, Part 1; Operation and Maintenance Instructions
EE216-LA-OMI-030 -	Volume 2, Part 2; Operation and Maintenance Instructions
EE216-LA-MMD-010 -	Volume 1, Chapters 1-8, Appendix A; Depot and Overhaul Maintenance Instructions
EE216-LA-MMD-020 -	Volume 2, Chapters 9-11; Depot and Overhaul Maintenance Instructions

4. GENERAL REQUIREMENTS

Four years of AN/FPN-63(V) trend data identified the following six (6) top system degraders, listed below in order of priority.

1. Receiver Group
2. Transmitter Group
3. Multiplexer-Demultiplexer Group
4. Control Console (Indicator)
5. Signal Data Converter (Processor)
6. Group and Azimuth & Elevation Antenna Group.

It is the intent of the Government to procure a Non-Developmental Item (NDI) LCE modification to upgrade and/or replace as the threshold the top five (5) system performance degraders with the objective to upgrade and/or replace all six(6) system performance degraders.

The PAR LCE shall be compatible with the design criteria established for U.S. Navy and Marine Corps ATC facilities so as not to degrade air traffic controllers' ability to provide safe, orderly and expeditious air traffic services. The PAR LCE will enable aircraft to routinely execute safe precision approaches to land at fixed base air-fields during periods of low ceiling and reduced visibility, or when pilots are unable to identify a landing approach path. The fixed base mission determines the base infrastructure and the PAR LCE must support that mission recognizing factors such as: weather, terrain, aircraft mix, operational tempo, and electronic environment.

The PAR LCE shall provide for Ground Controlled Approach (GCA) to 100 feet and 0.25 NM. The PAR LCE shall comply with the unrestricted facility classification commissioning flight inspection tolerances for precision approaches as defined in the U.S. Standard Flight Inspection Manual (NAVAIR 16-1-520).

The PAR LCE shall provide transparent coexistence with existing standardized position cabinetry in the radar air traffic control facility and shall utilize existing AN/FPN-63(V) cabinetry and foundations within the AN/FPN-63(V) shelter and Radar Air Traffic Control Facility when feasible. All upgraded assemblies shall be compatible and/or interface with all non-modified/retained components, sub-assemblies and existing system/foundation infrastructure.

The Government will provide an AN/FPN-63(V) shelter, and operations equipment as Government Furnished Property (GFP) to be delivered to the contractor within 30 days after award. All GFP equipment shall be returned to the SPAWAR Pacific upon completion of this contract.

The contractor shall minimize the cost of Non-Recurring Engineering.

All items produced under this contract shall be governed by the requirements of the specifications in this SOW. No changes shall be made to these documents without prior written approval by the Procuring Contracting Officer (PCO) and the Technical Point of Contact (TPOC).

5. OPERATIONAL REQUIREMENTS

The PAR LCE must be highly reliable, readily maintainable, and interoperable with existing air traffic control systems. The PAR LCE must use a common O&D maintenance philosophy and utilize to the greatest extent possible parts and components in the navy supply system. The amount of support equipment and required maintenance personnel should be considered to minimize operation and support costs. The PAR LCE shall meet or exceed the minimum requirements identified in this section.

5.1. ENVIRONMENTAL REQUIREMENTS

Other than specified, the PAR LCE shall meet the environmental requirements as specified in MIL-STD-810G.

5.1.1. TEMPERATURE

Operating Temperature: 0° F to +122° F

Non-Operating Temperature: -80° F to +160° F

5.1.2. HUMIDITY

Operating and Non-Operating Relative Humidity: 0 to 95% non-condensing

5.1.3. ALTITUDE

Operating and Non-Operating Altitude: at -100 feet to 10,000 feet sea level

5.1.4. WINDS

Wind Speed for Operating: 65 knots

Wind Speed for Non-Operating: 100 knots

5.1.5. ELECTROMAGNETIC INTERFERENCE (EMI)/ELECTROMAGNETIC COMPATIBILITY (EMC) REQUIREMENTS

The PAR LCE shall be designed to meet the EMI/EMC requirements as specified in MIL-STD-461F.

5.2. PAR OPERATIONAL AVAILABILITY (Ao)

The PAR must operate in all climatic conditions, terrain, and geographic locations in which Navy and Marine Corps Air Stations are located. Furthermore, it must be able to operate during times of limited visibility, including rain, snow, smoke, fog, and darkness. The PAR shall be operable in conditions with high humidity, sand, smoke, dust, fog, or in temperate, polar, alpine, swampland, desert, and maritime regions of the earth. The PAR Ao shall be 99%.

5.3. PAR MAINTENANCE

5.3.1. TOOLS AND TEST EQUIPMENT

Common tools and general purpose electronic test equipment (GPETE) shall be used to the maximum extent possible. No special tools or special purpose electronic test equipment (SPETE) shall be required.

5.3.2. PERIODIC INSPECTION AND PREVENTIVE MAINTENANCE

Periodic inspection requirements and preventive maintenance inspections shall be sufficient to ensure system components are operational and/or prepare for IMC. Maintenance shall be simplified to allow technicians to service and sustain the PAR without having to rely on In-Service Engineering Activity (ISEA)/depot support.

Preventive maintenance shall be performed at the organizational level. Mean time to perform preventive maintenance shall be no more than one hour per week (Threshold), and should be no more than 30 minutes per week (Objective). The preventive maintenance downtime shall not exceed 30 minutes for any single maintenance event. The contractor shall provide data to perform the Reliability Centered Maintenance (RCM) analysis and shall provide data for inclusion in generating Maintenance Index Pages (MIPs) and Maintenance Requirement Cards (MRCs). (Contract Data Requirement List (CDRL A001, A002)

5.3.3. MEAN TIME BETWEEN FAILURE (MTBF): Mean Time Between Failure is used to measure the system reliability. It is calculated by dividing the total system operating time by the number of failures requiring corrective maintenance actions. The PAR LCE threshold for MTBF shall be greater than 2000 hours with an objective of greater than 3000 hours.

5.3.4. MEAN TIME BETWEEN CRITICAL FAILURE (MTBCF): A critical failure is defined as any failure that deems the system non-operational or does not allow the system to perform its intended mission. The PAR LCE threshold for MTBCF shall be greater than 4000 hours with an objective of greater than 6000 hours.

5.3.5. MEAN TIME TO REPAIR (MTTR): MTTR is calculated by measuring all potential maintenance actions from the time a failure is identified until the system is brought back to a full operational status. As an example, this would include the time to power down the system, troubleshooting time, removal and replacement of the failed item, system power-up and verification of system repair actions. The PAR LCE MTTR for all repair actions shall have a threshold of less than 1 hour with an objective of less than 30 minutes.

5.3.6. MANPOWER AND PERSONNEL

Operation and maintenance of the PAR LCE should reduce and shall not increase current Navy or Marine Corps manpower authorization or skill level requirements.

5.3.7. TRAINING CONCEPT

Air traffic controller and maintenance technician training shall readily merge with existing ATC training pipelines currently conducted at existing Navy/Marine Corps ATC Schools in conjunction with the below statements, and shall reduce or maintain the overall training times required.

Dynamic Training Simulator: Controller training shall be provided that includes parameters that affect actual operation such as aircraft characteristics and environmental conditions. The training simulator shall exactly duplicate the displays and controls of the operational PAR LCE, and shall provide heading, turn rate, altitude, and rate of climb and descent, and ground speed controls. The trainee's simulated aircraft shall be able to be controlled by a trainer via a separate display. The training simulator shall be capable of recording the training session for playback.

Authoring Instructional Materials System (AIMS) Training: The contractor shall work with Naval Air Technical Training Center (NATTC) Pensacola to develop a training change package for incorporation into existing course curriculum and provide input for fleet "difference" training. The contractor shall update Schoolhouse Schematics and provide updated change information to the Government. The contractor shall provide the above training change package in AIMS format to the Government. **(CDRL A003)**

Trainer Training: The contractor shall host one training event capable of supporting eight people at the contractor facility no more than 180 days after acceptance of the first article unit. **(CDRL A004)**

5.3.8. PROVISIONING AND LOGISTIC SUPPORT

The contractor shall develop and deliver the documents indicated in the below subparagraphs to the Government. These documents shall go through a Government review cycle. All documents must be completed and the final version delivered to the Government prior to the delivery of the First Article Test Unit.

The contractor shall provide provisioning parts data containing the data elements required for the Interactive Computer Aided Provisioning System (ICAPS) data file exchange format. This parts data is acceptable in MS Excel format providing the required ICAPS data elements are identified by column header. The contractor shall provide all Supplementary Provisioning Technical Data (SPTD) to include data sheets and drawings required to support the parts data. To the maximum extent possible PAR LCE components shall be readily available through current stocks within the DoD supply system at the Lowest Repairable Unit (LRU). The product baseline shall be frozen prior to submission of this data. **(CDRL A005)**

5.3.8.1 Integration Package

The contractor shall prepare Integration Procedures in the contractor format, which shall present in detail all parts that need to be removed from the AN/FPN-63(V) system, explain in detail all modifications required, provide a list of new parts to be installed, detailed integration instructions, an integration drawing package, a list of materials and tools required, typical time to complete, and check out procedures to ensure the complete system functionality. **(CDRL A006)**

The contractor shall be present at the designated Government site 30 days or earlier, after the delivery of the first and second production units to support validation/verification testing of integration procedures.

5.3.8.2 Technical Manual Update Pages

The following technical manuals will be provided in PDF format as GFI for the proposal and in word perfect format upon award of the contract. The contractor shall review the following technical manuals and provide comprehensive updates to support the Organizational to Depot (O to D) level maintenance of the AN/FPN-63(V) LCE configuration. Contractor shall coordinate with the Government to obtain new Technical Manual numbers.

EE216-LA-OMI-010 -	Volume 1, Chapters 1-8; Operation and Maintenance Instructions
EE216-LA-OMI-020 -	Volume 2, Part 1; Operation and Maintenance Instructions
EE216-LA-OMI-030 -	Volume 2, Part 2; Operation and Maintenance Instructions
EE216-LA-MMD-010 -	Volume 1, Chapters 1-8, Appendix A; Depot and Overhaul Maintenance Instructions
EE216-LA-MMD-020 -	Volume 2, Chapters 9-11; Depot and Overhaul Maintenance Instructions

The contractor shall either update or create a new Technical Manual for comprehensive troubleshooting that supports repair of displays. **(CDRL A007)**

5.3.8.3 Spares

The contractor shall provide a Supply Support Summary and Data Products which will be used to identify Installation/Check-Out (INCO) and interim requirements, and catalog the range and quantity of spares, repair parts and support items to be acquired to operate, maintain, and provide for the life cycle support of the PAR LCE configuration. **(CDRL A008)**

Additionally, the contractor shall provide a spares parts kit to support INCO and interim spares for the PAR LCE configuration that were identified in CDRL A008. Spares shall be at LRU level based on an engineering failure rates and expected likelihood of LRU's failing during the PAR LCE integration event.

5.3.8.4 Diminishing Manufacturing Sources of Material Supply (DMSMS) /Parts Obsolescence

The Contractor shall resolve all parts obsolescence and/or diminishing manufacturing issues that arise with respect to the hardware to be delivered. These costs may not be charged to any other line items or contracts. The Supply Support Summary shall include a DMSMS report to address obsolescence concerns. **(CDRL A009)**

5.3.8.5 Nomenclature Assignment

The contractor shall provide the data necessary for nomenclature assignment, revision, or cancellation. Contractor shall provide draft nomenclature DD61 form. **(CDRL A010)**

5.3.8.6 Unique Item Identification

A Unique Item Identification Device shall be attached to each replaceable item and the system in accordance with MIL-STD-130N and the clause at DFARS 252.211-7003, "Item Identification and Valuation (JUN 2011)". Marked items shall be registered and validated with the DOD UID Registry. All production assets requiring radio frequency identification (RFID) shall comply with the requirements of MIL-STD-129P.

5.4. DOCUMENTATION AND CONFIGURATION CONTROL

The developing contractor shall provide all required documents to support operation, maintenance, and hardware/software configuration control in Microsoft Office 2003 format or later.

5.5. SAFETY

The PAR LCE shall not be comprised of toxic chemicals, hazardous materials, or ozone-depleting substances, and shall not be produced using manufacturing processes that have a detrimental impact upon the environment, from the time of design and manufacture through its life-cycle.

The PAR operational user interface shall support system operations to allow operators to perform their duties minimizing the labor hours required to maintain the system.

5.6. LOCATION OF PAR INSTALLATION

The PAR LCE will be installed by the Government at existing locations utilizing existing AN/FPN-63(V) cabinetry and foundations within the PAR shelter and radar Air Traffic Control Facility in accordance with contractor provided instructions.

5.7. SYSTEM ALIGNMENT

To verify system accuracy after preventive and corrective maintenance or prior to flight operations, the PAR LCE shall be capable of aligning the antennas to the designated target (i.e. corner reflector) location and display the alignment data on the display consoles in terms of angle and range.

5.8. PAR INPUT POWER REQUIREMENTS

The PAR shall be compatible and operate with both of the following power sources: primary commercial electrical power or backup power.

5.8.1. PRIMARY COMMERCIAL ELECTRICAL POWER

120/208 VAC, 60 Hz, 4 wire, three phase, 12.8 KVA

5.8.2. UNINTERRUPTIBLE POWER SUPPLY (UPS)

The PAR shall be compatible with an UPS which shall provide in-line filtering of commercial power and provide instant protection from a momentary power interruption. The UPS shall have the capacity to power the PAR LCE display and processor to allow for orderly shutdown. Within the proposal, the contractor shall provide detailed information regarding UPS specification, size and location within PAR shelter.

5.9. PAR REMOTE OPERATION

The remote operation capability of the PAR LCE from the radar site to the radar air traffic control facility shall be up to 10,000 feet (Threshold), with an objective of 16,000 feet (Objective). In addition to PAR displays in the radar air traffic control facility, the PAR LCE system functions shall be able to be controlled remotely from the radar air traffic control facility.

5.10. PAR DISPLAY CAPABILITY

The PAR LCE shall use a digital full-color display with multi-function capabilities for maintenance, operations, and training. The PAR LCE display shall be suitable for use in both a daylight and limited light environment. Common user interfaces to the digital display shall be used in the PAR LCE, to include display of raw data/ground target, as well as aircraft target and track data blocks.

The PAR LCE shall incorporate variable target trail history and digital weather display for severe thunderstorm cell avoidance.

The PAR LCE shall incorporate Azimuth-high (Azimuth tilt) and Elevation-wide (Elevation twist) indicators. The PAR LCE shall incorporate crosshair vertical and lateral displays of course deviation from centerline and glideslope.

5.11. PAR ACQUISITION AND TRACKING

The PAR LCE shall be able to detect and display all targets within the prescribed scan/coverage areas (refer to paragraph 5.13) to include: course line for azimuth, glideslope and lower safe limits for elevation, and range.

The PAR LCE shall provide tracking capability so controllers can acquire or track the targets on both master and slave control consoles. The tracked target shall have a tracking symbol or indication to indicate the target being tracked and tracked information shall be displayed in range and altitude on both AZ and EL display.

The PAR LCE operational user interface shall be designed to provide efficient workload management through the effective use of graphic displays, text displays, and presentation of system and task status information. System messages and displays presented to operators shall be appropriate and relevant to operators' activities and knowledge levels.

The PAR LCE operational user interface shall be designed to minimize operator performance errors and preclude operator errors on critical tasks through the use of error checking and user validation.

5.11.1. TRACKING IN CLEAR WEATHER

The PAR LCE shall detect and display targets at speeds of:

- 40 knots to 250 knots
- Radar cross section down to 1.0 m² (Threshold), 0.5 m² (Objective)
- Probability of detection (Pd) of 90% (Threshold), 95% (Objective)

5.11.2. TRACKING IN RAIN CLUTTER ENVIRONMENT

With a rain rate of 1 inch per hour at 5 NM rain cell, the PAR shall detect and display targets at speeds of:

- 40 knots to 250 knots
- Radar cross section down to 1.0 m² (Threshold), 0.5 m² (Objective)
- Probability of detection (Pd) of 85% (Threshold), 90% (Objective)

5.11.3. OVERALL SYSTEM MOVING TARGET INDICATOR/MOVING TARGET DETECTOR (MTI/MTD) PERFORMANCE

Improvement Factor: 34 dB

5.12. PAR RESPONSE TIME AND UPDATE RATE

The PAR LCE shall provide for a target track update a minimum rate of once per second (Threshold), five per second (Objective).

5.13. PAR COVERAGE

The PAR LCE shall be capable of detecting its target within the following coverage:

- From -1° to +7° (Threshold) in elevation.
- From -1° to +13° (Objective) in elevation.
- From ±10° or 20° (Threshold) in azimuth.
- From ±15° or 30° (Objective) in azimuth.
- Distance of 10 NM (Threshold), 20 NM (Objective) in range.

The PAR LCE shall automatically scan this volume at least once per second (Threshold).

5.14. PAR ANTENNA CONTROL

- The PAR LCE shall be capable to vertically tilt the azimuth antenna from -1° to $+7^{\circ}$ (Threshold), from -1° to $+13^{\circ}$ (Objective).
- The PAR LCE shall be capable to horizontally twist the elevation antenna $\pm 10^{\circ}$ or 20° (Threshold), from $\pm 15^{\circ}$ or 30° (Objective).

5.15. PAR RANGE ACCURACY

The PAR LCE shall provide range accuracy for all targets within the prescribed scan coverage: for search and track, $\pm 2\%$ of the actual range from touchdown or ± 60 feet, whichever is greater (Threshold), $\pm 1\%$ for track only (Objective) at two sigma.

5.16. PAR ELEVATION ANGULAR ACCURACY

- For search and track, $\pm 0.23^{\circ}$ (Threshold), for track only $\pm 0.12^{\circ}$ (Objective) at two sigma.
- For elevation twist angular accuracy, $\pm 0.25^{\circ}$.

5.17. PAR AZIMUTH ANGULAR ACCURACY

- For search and track, $\pm 0.34^{\circ}$ (Threshold), for track only $\pm 0.18^{\circ}$ (Objective) at two sigma.
- For azimuth tilt angular accuracy, $\pm 0.25^{\circ}$.

5.18. PAR TARGET SEPERATION/RESOLUTION

- The PAR LCE shall be capable of separating two 1.0 m^2 targets at the same azimuth by 400 feet (Threshold), 200 feet (Objective) in range at two sigma.
- The PAR LCE shall be capable of separating two 1.0 m^2 targets at the same range by 1.2° in azimuth at two sigma.
- The PAR LCE shall be capable of separating two 1.0 m^2 targets at the same range and azimuth by 0.6° in elevation at two sigma.

5.19. RUNWAY COVERAGE

The PAR LCE shall be capable of providing precision approaches to a minimum of six runways, dependent on airfield layout/runway configuration (runway lengths and distance between runways and taxiways).

5.20. FREQUENCY RANGE

The PAR LCE shall operate in a frequency range currently approved for U.S. military radar systems (9.00 GHz - 9.16 GHz).

The PAR LCE shall provide for PAR radiated frequency tuning.

The contractor shall provide Hazards of Electromagnetic Radiation to Ordnance (HERO), Hazard of Electromagnetic Radiation to Personnel (HERP), and Hazard of Electromagnetic Radiation to Fuel (HERF) analysis to the Government. **(CDRL A011)**

5.21. FAULT ISOLATION CAPABILITIES

The PAR LCE NDI solution shall be capable of detecting electrical and electronic faults within the PAR system, with a false alarm rate of no more than 10%.

5.22. PAR TRAINING DEVICE

The PAR LCE shall have an embedded capability to provide proficiency training for PAR operators (radar final controllers). This training capability shall provide simulated precision approaches, which include simulated target generation, voice response, and simulated weather.

5.23. SYSTEM SOFTWARE

The PAR LCE software shall be designed using no less than Capability Maturity Model Integration Level 2 practices and procedures.

5.23.1. Information Assurance

5.23.1.1. Requirements.

The Contractor shall develop and deliver the PAR LCE systems to meet all applicable Information Assurance (IA) requirements as defined in DoDD 8500.0IE, DoDI 8500.2, DoDI 8520.2, DODI 5000.02, DODI 8580.1, SECNAVINST 5239.3B, SECNAVINST 5239.3A, OMB A-130, Appendix III, and DON CIO Memo, Information Assurance Policy for Platform IT (PIT), dated 26 April 2010. The Contractor shall include the weapon systems software development, test and evaluation equipment and networks or enclaves used for development and sustainment of the PAR LCE system. Applicable controls will be identified during the post award kick-off meeting with the Government System Security Engineering Team or SSE representative collaboration and will be based on system assigned Mission Assurance Category and Confidentiality Level of Classified.

5.23.1.2. Accreditation Documentation.

The Contractor shall provide technical data required to complete Information Assurance Accreditation documentation so the Government may pursue and maintain a PIT Risk Approval or Authority to Operate. Data submitted by the Contractor shall include at minimum, system descriptions, system diagrams of all IT components of the system, PIT boundary IT interface information, and IT ports, protocols and services required for any connectivity external to the system. **(CDRL A012)**

5.23.1.3. Accreditation Assessment.

The Contractor shall furnish test reports, system scans or compliance results upon request to support the accreditation assessments. **(CDRL A013)**

5.24. SOFTWARE MAINTENANCE PACKAGE

The contractor shall provide updated software to resolve designated safety of flight and information assurance concerns as well as routine updates to correct discovered software errors identified by the Government trouble reports in association with the first article test units and the first production unit. **(CDRL A014)**

6. SUBASSEMBLY SPECIFICATIONS

Subassemblies of the PAR LCE replacement shall be designed to meet or exceed the requirements contained in this SOW. For non-phase array PAR, transmitting and receiving RF sections shall be dual channel and shall meet the requirements specified in paragraphs 6.1 through 6.3. The contractor may propose the use of current PAR Antennas to meet these requirements.

6.1. ANTENNAS

6.1.1. AZIMUTH ANTENNA

Horizontal Beamwidth:	0.85°
Vertical Beamwidth:	2.2°
Gain:	39.7 dB
Sidelobes:	-25 dB
Polarization:	Circular or linear
Scan Angle:	20° or from -10° to +10° (Threshold) 30° or from -15° to +15° (Objective)
Scan Rate:	1 scan/sec
Vertical (tilt) Servo:	-1° to 7° (Threshold) -1° to 13° (Objective)

6.1.2. ELEVATION ANTENNA

Horizontal Beamwidth: 3.8° csc^2
Vertical Beamwidth: 0.55°
Gain: 40.3 dB
Sidelobes: -25 dB
Polarization: Circular or linear
Scan Angle: 8° , from -1° to $+7^\circ$ (Threshold)
 14° , from -1° to $+13^\circ$ (Objective)
Scan Rate: 1 scan/sec
Horizontal (twist) Servo: 20° or -10° to $+10^\circ$ (Threshold)
 -15° to $+15^\circ$ (Objective).

6.2. TRANSMITTER

Frequency Range: 9.00 GHz – 9.16 GHz
Operating Frequency: 9.08 GHz
Frequency Tuning: Automatic Frequency Control (AFC) controlled by servo loop
Peak output Power: 80 KW minimum
Pulse Width: 0.2 usec nominal
PRF: 2750 Hz fixed
3300 Hz (7, 8, 9) staggered

6.3. RECEIVER

Type: Coherent
Frequency Range: 9.00 GHz – 9.16 GHz
Operating Frequency: 9.08 GHz
Minimum Discernable Signal: -101 dBm
Noise Figure: 11 dB

6.4. DISPLAY CONSOLE

Screen Monitor Size: Minimum 20 inch ruggedized flat screen, EMI shielded
Display Format: Elevation section in upper portion, Azimuth section in lower section
Cursor Type: Logarithmic curves (Beta format) including glideslope, safety, and courseline
Displayed Range: Selectable between 5 NM and 10 NM
Range Marks: Touchdown point dependent, 1 NM intervals, every 5 NM range mark intensified

Information displayed: AZ/EL cursors, Normal and MTI/MTD video, servo locations with blank beamwidth sectors crossing entire range on both AZ/EL display, tracked data, antenna alignment data

No. of Preset (runway) Cursors: 6 selectable cursors minimum (for different runway selection) interfaced with the Government developed turntable

Video Type: Selectable between normal and MTI/MTD video

Glideslope: Default value of 3°, selectable between 2° and 4° minimum

Screen Monitor Adjustments: Color, brightness, contrast, intensity, vertical/horizontal screen alignments, etc.

Display Control: Selectable between master and slave controls

6.5. PROCESSOR

Type: Coherent
Filter: Digital single or double canceller (selectable)
Blind Velocity (Repetitive): 848 knots
Overall System MTI IMP
Factor: 34 dB

7. PAR LCE SYSTEM ENGINEERING TECHNICAL REVIEW (SETR) EVENTS

The contractor shall conduct the required SETR events for the PAR LCE project in accordance with NAVAIRINST 4355.19D. For each event a description of the purpose of the event, relative timing, and required outputs are identified in the corresponding sections. The events have been tailored to meet the scope of this project. All events will be chaired by the Government Technical Point of Contact (TPOC).

7.1. Post Award Kick-Off Meeting

The contractor shall host a post award kick-off meeting at their facility within 30 days of contract award. The purpose of the meeting will be to discuss requirements, GFE/GFI requirements, roles and responsibilities and critical path. (CDRL A020, A021)

7.2. PRELIMINARY DESIGN REVIEW (PDR)

7.2.1. PURPOSE

The contractor shall conduct a PDR as a technical assessment establishing the complete physically allocated baseline to ensure that the system under review has a reasonable expectation of being judged operationally effective and suitable. This review represents a physically architected system, preliminary detailed design by sub-system suppliers, and critical technologies matured to Technology Readiness Level (TRL) 6. Completion of PDR will establish the allocated baseline. The PDR shall be conducted at the contractor's facility. **(CDRL A015, A020, A021)**

7.2.2. TIMING

The contractor shall conduct this event approximately 120 days After Receipt of Order (ARO) spell out. **(CDRL A015)**

7.2.3. REQUIRED OUTPUTS (CDRL A015)

1. Completed Sub-system specifications
2. Human Systems Design standards flowed to sub-systems
3. Reliability and Maintainability diagnostics have been addressed in design allocations
4. Top Level Software Design Description and/or Software Architecture Description complete
5. Requirements Verification Traceability Matrix (RVTM) covers sub-system allocations
6. Draft Acceptance Test Plan
7. Draft First Article Test Plan
8. Complete Software Integration Plan
9. Sub-system R&M engineering analysis, Failure Modes, Effects, and Criticality Analysis (FMECA) scheduled to support System Hazard Analysis
10. Logistics element requirements allocated to system design
11. Training requirements allocated to system design
12. IMS shows critical path through CDR
13. Program technical risks identified
14. Program execution risks identified
15. Draft Integration Procedure

7.3. CRITICAL DESIGN REVIEW (CDR)

7.3.1. PURPOSE

The contractor shall conduct a CDR as a technical assessment establishing the build baseline to ensure that the system under review has a reasonable expectation of being judged operationally effective and suitable. This review assesses the final design as captured in product specifications for each Configuration Item in the system, and ensures that item has been captured in detailed documentation. Product specifications for hardware enable the fabrication, and include production drawings. Product specifications for software enable coding of the Computer Software Configuration Item. The CDR brings to closure technical risk mitigation and alternate design paths in detailed system design. The CDR shall be conducted at the contractor's facility. **(CDRL A016, A020, A021)**

7.3.2. TIMING

The contractor shall conduct this event approximately 240 days ARO. (CDRL A016)

7.3.3. REQUIRED OUTPUTS (CDRL A016)

1. Completed system design specifications
2. Engineering drawings ready for release to manufacturing
3. Software Top Level Design Description and/or Software Architecture Description updated
4. Software Interface Design Description or equivalent updated
5. Requirements Verification Traceability Matrix (RVTM) Complete
6. Test Plans are complete
7. System level R&M analyses complete-final allocations, math models, predictions, FMECA, environmental, and diagnostics
8. Manufacturing and production planning complete
9. Logistics analysis complete and plans established
10. Training plan complete
11. IMS shows critical path through testing
12. Program technical risks identified and mitigation plans in place
13. Program execution risks identified and mitigation plans in place
14. Updated Integration Procedure

7.4. TEST READINESS REVIEW (TRR)

7.4.1. PURPOSE

The TRR is a technical assessment establishing the configuration used in test to ensure that the system has a reasonable expectation of being judged operationally effective and suitable. TRR will be conducted prior to First Article Test to ensure all requirements and resources are in place to proceed. The TRR shall be conducted at the contractor's facility. (CDRL A017, A020, A021)

7.4.2. TIMING

TRR shall be conducted no less than 30 days prior to First Article Test. (CDRL A017)

7.4.3. REQUIRED OUTPUTS (CDRL A017)

1. Test report content mutually agreed upon
2. Data reduction procedures and responsibilities are documented and accepted
3. Data analysis procedures and responsibilities are documented and accepted
4. Logistics and supply support for testing is adequate
5. Detailed test schedule established and fully resourced
6. Technical risks are identified and mitigation plans in place
7. Execution risks are identified and mitigation plans in place
8. Government approved Factory Acceptance Test Procedure (ATP) in accordance with the General Acceptance Test Plan (GATP)

7.5. PRODUCTION READINESS REVIEW (PRR)

7.5.1. PURPOSE

The contractor shall conduct a Production Readiness Review (PRR) as an examination of a program to determine if the design is ready for production and the producer has accomplished adequate production planning without incurring unacceptable risks that will breach thresholds of schedule, performance, cost, or other established criteria. The full, production-configured system is evaluated to determine that it correctly and completely implements all system requirements, and whether the traceability of final system requirements to the final production system is maintained. The PRR shall be conducted at the contractor's facility. (CDRL A018, A020, A021)

7.5.2. TIMING

Contractor shall conduct PRR 30 days after notification of the government's intent to execute procurement of the initial production kit. (CDRL A018)

7.5.3. REQUIRED OUTPUTS (CDRL A018)

1. Transition to manufacturing plan
2. All CDR action items have been closed or mitigated
3. Test report has been approved
4. Change control process has been established and the Government has approved the production configuration baseline
5. Current risk assessment
6. Final Integration Procedure

7.6. PHYSICAL CONFIGURATION AUDIT (PCA)

7.6.1. PURPOSE

The Government will conduct a PCA to examine the actual configuration of the system being produced in order to verify that the related design documentation matches the system as specified in the contract. PCA shall be conducted at the contractor's facility. (CDRL A019)

7.6.2. TIMING

The Government will conduct a PCA prior to final acceptance (DD250) of the initial production kits.

7.6.3. REQUIRED OUTPUTS

1. PCA report delivered and accepted

7.7. TECHNICAL INTERCHANGE MEETINGS (TIMs)

7.7.1. PURPOSE

TIMs shall be conducted on a monthly basis, at a minimum, in order to implement timely resolution of technical risks. TIMs shall be conducted either via video teleconference, teleconference or at a location designated by the Government. Locations shall be designated at each TIM for the subsequent TIM. **(CDRL A020, A021)**

8. FIRST ARTICLE UNIT

The contractor shall prepare one first article unit for testing in accordance with the contract, to be complete within 9 months or less after issue of first order and 30 days prior to the scheduled acceptance testing. The contractor shall conduct a Factory acceptance test per Government approved Factory Acceptance Test Procedure (ATP) at the contractor facility, in accordance with the General Acceptance Test Plan (GATP). **(CDRL A022)**

Additionally, the PAR LCE must pass an FAA flight certification facilitated by the contractor and witnessed by the Government. Upon successful completion of the Factory Acceptance Test and the receipt of FAA Flight Certification, the contractor shall conduct a Government witnessed Acceptance Test in accordance with a Government approved Acceptance Test Procedure at contractor facility. Upon Government deemed successful completion of the Acceptance Test, the Government will accept the First Article Unit which will then be provided as GFP to the contractor to be used during production and returned to SPAWAR PAC upon completion of this contract. The performance of the first article unit shall be functionally equivalent to the performance of the deliverable production units per the SOW. The first article unit shall maintain an equivalent mechanical form factor to the deliverable production units per the mutually agreed upon Installation Drawing Package (IDP). **(CDRL A006)**

9. PROGRAM MANAGEMENT

The contractor shall appoint a knowledgeable individual who shall be the point of contact for all work related to this contract.

9.1. PROGRESS STATUS REPORTS

The contractor shall submit a Progress Status Report and Project Schedules for review and approval by the Government which contains, as a minimum, the following items for each principal item to be supplied:

- The project stages and milestones
- Significant activities
- Deliverables
- Contractor manufacturing schedule
- Assembly
- Inspection

- Tests
- Trials

The Project Schedule shall provide sufficient detail to accurately track progress of the efforts; the Project Schedule shall be updated regularly and supplied as part of the monthly Progress Status Report. (CDRL A023)

9.2. CONFIGURATION AND DATA MANAGEMENT

9.2.1 Configuration Management Program

The contractor shall maintain a Configuration Management (CM) Program, which includes an organizational structure with configuration control methods, configuration audits, and configuration status accounting procedures. The CM program strategy shall be documented via a CM plan in accordance with MIL-HDBK-61A and Electronic Industries Alliance (EIA)-649. The program shall cover the duration of the contract. (CDRL A024)

9.2.1.1 Configuration Identification

The configuration baseline will be established upon Government acceptance of a Configuration Audit Summary Report (CASR). (CDRL A019)

9.2.1.2 Configuration Control

Configuration Baselines and documentation may be changed only as the result of an Engineering Change Proposal (ECP) approved by the PMA213 Decentralized Configuration Control Board (DCCB). (CDRL A025)

Variances from documented design/specification documents shall only be accepted when a Request for Deviation (RFD) has been approved by the PMA213 DCCB. (CDRL A026)

The contractor shall maintain records for all Class II ECPs and make them available for Government review. Class II ECPs require Defense Contract Management Agency (DCMA) or PMA213 classification concurrence. Engineering changes shall be classified IAW MIL-HDBK-61A. To the maximum extent possible all hardware and software changes shall be backward compatible with all existing hardware and software configurations.

9.2.2 Configuration Status Accounting.

The contractor shall maintain procedures to track the status of changes to the baseline and to units already produced and to track the implementation of approved changes.

9.3. IDENTIFICATION MARKING OF U.S. MILITARY PROPERTY

The contractor shall properly identify and mark U.S. Military property in accordance with Defense Acquisition Regulation (DFARS) 252.211.7003.

9.4. LEVEL III DRAWINGS

Level III Engineering Drawings shall be prepared in accordance with MIL-STD-961E(C/1) in CAD or CAD compatible format, or Solid works format. These drawings shall then be made available to the Government 180 days or less after procurement of the drawings.

The contractor shall prepare product drawings and associated lists to provide the design, engineering, manufacturing and quality assurance requirements information necessary to enable the procurement or manufacture of an item essentially identical to the original item. The products shall be defined to the extent necessary for a competent manufacturer to produce an item identical to the original item. The products shall be defined to the extent necessary for a competent manufacturer to produce an item, which duplicates the physical, interface and functional characteristics of the original product, without additional design engineering effort or recourse to the current design activity. Engineering data shall reflect the approved, tested, and accepted configuration of the defined delivered item.

Drawings shall include Commercial and Government Entity (CAGE) Code, number and revision assignments shall be coordinated through Government. Upon approval, all drawing final signatures will be provided by the ISEA. **(CDRL A027)**

10. CONTRACTORS CERTIFICATE OF COMPLIANCE

The contractor shall provide a Certificate of Compliance (C of C) with each deliverable unit, which certifies that all inspections and tests have been performed without fault in accordance with paragraph 11 through 12.3, as well as copies of the Acceptance Test Reports. **(CDRL A028, A029)**

All C of C's, and Acceptance Test Reports, shall be signed by a representative of the appropriate Quality Assurance Division of the contractor.

11. QUALITY ASSURANCE

The contractor shall have a documented Quality Management System based on an industry standard such as ISO 9001:2000, AS9100 or equivalent standard which is subject to review and approval by the Government.

11.1. DELIVERABLE PRODUCT VALIDATION

The Government shall have the right to perform scheduled visits to review the progress of the program and quality of the hardware or perform site inspections of the product to review performance against the specifications in the SOW. The Government representative will give the contractor at least 48 hours advanced notification that a visit is going to be conducted.

12. TESTING

The contractor shall conduct the testing identified in accordance with the General Acceptance Test Plan NAWCAD document 43140-00991.

12.1. TEST REPORTS

The contractor shall generate and maintain test logs for all hardware to be delivered under this contract. The contractor shall prepare inspection and test reports in accordance with the contractor's inspection and test methods. The contractor shall provide completed test data sheets for inspection and test reports. **(CDRL A029)**

12.2. WORKMANSHIP INSPECTION

Each unit shall be inspected by the contractor to verify that it is free from workmanship defects. Workmanship shall comply with industry-recognized standards listed in paragraph 3 of this SOW.

12.3. CONFIGURATION IDENTIFICATION

The contractor shall inspect each item to verify that its configuration is consistent with the Governments accepted first article unit configuration.

13. ADMINISTRATION

13.1. SURVEILLANCE

The Government reserves the right to conduct necessary management and technical surveillance and liaison within the contractor's facilities as it pertains to this program.

13.2. DELIVERY OF DATA

The contractor shall supply data in accordance with the requirement and delivery schedule given in the Contract Data Requirements List (CDRL). The contractor supplied data shall comply with all requirements of this contract.

13.3. PACKAGING, HANDLING, STORAGE AND TRANSPORTATION

The contractor shall pack and ship the PAR LCE kits using best commercial practices and ship by any approved traceable conventional mode of transportation. Handling of the PAR LCE kits is not expected to pose any unusual problems. The contractor shall ensure the PAR LCE kits are secured in a shipping case taking care that displays, buttons and switches are protected. The PAR LCE kits should be shipped using best commercial practices for shipping within the continental United States.

13.4. WAIVER/DEVIATION APPROVALS

The contractor shall request and obtain prior written approval for all waivers and deviations relative to the requirements of this SOW from Contracts 2.5 and the TPOC. These requests shall contain, as a minimum, a definition of the non-compliance, the net effect on applicable specification(s) and corrective action to preclude recurrence. Approval of waivers must be incorporated as a modification to the contract. **(CDRL A026)**